

## Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



# Foreign AGRICULTURE

REVIEW OF FOREIGN FARM POLICY, PRODUCTION, AND TRADE

## IN THIS ISSUE

AGRICULTURAL PRODUCTION IN GUATEMALA

THE AGRICULTURE OF CRETE

ISSUED MONTHLY BY THE UNITED STATES DEPARTMENT OF AGRICULTURE  
OFFICE OF FOREIGN AGRICULTURAL RELATIONS • WASHINGTON, D. C.

FILE COPY  
FROM WASHINGTON FIELD  
ACTED

# CONTENTS

~~~

|                                                         | Page |
|---------------------------------------------------------|------|
| AGRICULTURAL PRODUCTION IN GUATEMALA . . . . .          | 195  |
| The agricultural pattern . . . . .                      | 197  |
| Food crops . . . . .                                    | 198  |
| Export crops . . . . .                                  | 201  |
| Other crops . . . . .                                   | 205  |
| Livestock . . . . .                                     | 205  |
| Foreign trade . . . . .                                 | 206  |
| Composition of trade . . . . .                          | 206  |
| Trade with the United States . . . . .                  | 207  |
| Government policies and plans for agriculture . . . . . | 208  |
| Government assistance . . . . .                         | 208  |
| Plans for expansion . . . . .                           | 209  |
| THE AGRICULTURE OF CRETE . . . . .                      | 212  |

~~~

Vol. 7, No. 9

September 1943

*Foreign Agriculture* is issued monthly by the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may also be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., 10 cents a copy, or by subscription at the rate of \$1.00 per year, domestic; \$1.60 per year, foreign.

## AGRICULTURAL PRODUCTION IN GUATEMALA . . . . .

By Kathryn H. Wylie\*

*For centuries the people of Guatemala have grown their own food on the fertile plains and hillsides around their villages. Even with an expanding foreign population, both in the cities and in the coastal banana zones the only major food imports are wheat flour and fats and oils. Coffee and bananas are the leading items traded for manufactures and food products from abroad, but the economy of the country is not dependent on the income from one or two crops only as is that of neighboring countries. In the search for potential Latin American producing regions for the many strategic commodities no longer available from abroad, Guatemala offers promising areas, particularly for the production of rubber and quinine. Food shortages do not exist to hamper such developments, and the policy of the Government favors agricultural expansion.*

The precolonial Indian economy of Guatemala included extensive cultivation of such characteristically American crops as corn, cacao, beans, and potatoes. The conquistadores soon introduced wheat, sugar, barley, and, later on, bananas and coffee. As the region of free Indian villages changed to a Spanish colony and later to an independent republic, agricultural and livestock production remained the dominant influence in the nation's economy. Differences in elevation, climate, and soils provided conditions suitable for growing potatoes and wheat in the highlands, coffee on the lower mountainsides, and bananas on the coastal plains.

Guatemala, the northernmost republic of Central America, is about equal in size to the State of Ohio, although estimates of its area vary from 38,000 to 48,000 square miles (9, 10, and 11).<sup>1</sup> (See fig. 1.)

About 55 percent of Guatemala's 3,283,000 people are Indians of Mayan and Quiché stock, and, of the 44 percent listed in the 1940 census as white and mestizo (mixed blood), the majority are mestizos (5). There are only 4,000 Negroes, located mostly in the coastal regions, and 1,000 persons of the yellow race. The few white people live largely in the capital city, whereas the Indians live in small villages scattered on the fertile plains and mountain plateaus, with a few settlements in the coastal banana-growing areas. The large Department of Petén is sparsely settled.

The tropical coastal plains on both the Atlantic and Pacific Oceans support the banana industry. The temperate interior plateau is suitable for general crops, with coffee predominating on the lower slopes. The rainy season, from May to December, is general throughout the country, but the average volume of rainfall varies from 137 inches a year on the Atlantic coast to 62 inches on the Pacific coast.

Guatemala's fertile soils of five major types constitute its chief natural resource (12). (See fig. 2.) The northern third of the country, including the large Department of Peten, contains very fertile residual clay formed by the disintegration

\* Office of Foreign Agricultural Relations.

<sup>1</sup> Italic figures in parentheses refer to Literature Cited, page 210.





FIGURE 1.—Map of Guatemala.

of calcareous rock. The region is flat and little soil has washed away. Corn and beans grow well on these soils, as does coffee. To the south of this region is a large zone called "Laterita," consisting of red or yellow acid soil, high in iron but less fertile than that to the north. A great proportion of the most fertile topsoil on the slopes of the hills has washed away, but enough remains to support a moderate share of the coffee industry. Bordering this second region, to the south and west, is volcanic soil from the disintegration of volcanic rock. This soil is generally fertile and provides some of the best coffee land in the country, although part of the area is too dry for profitable agriculture. The extensive plain on the Pacific coast has black volcanic alluvial soils formed by the washing down of fine volcanic particles by the numerous rivers of the plain. This is the country's chief banana area. Finally, the newest and most fertile alluvial soils are those at the mouths of rivers and streams that overflow each year. They are largely identified with general food crops.

After the products of the soil, the forests provide more income than any other resource. Chicle (a chewing-gum base) is the third most valuable export, and dyewood, tanning woods, and fine cabinet woods are also exported. (See table 6.)

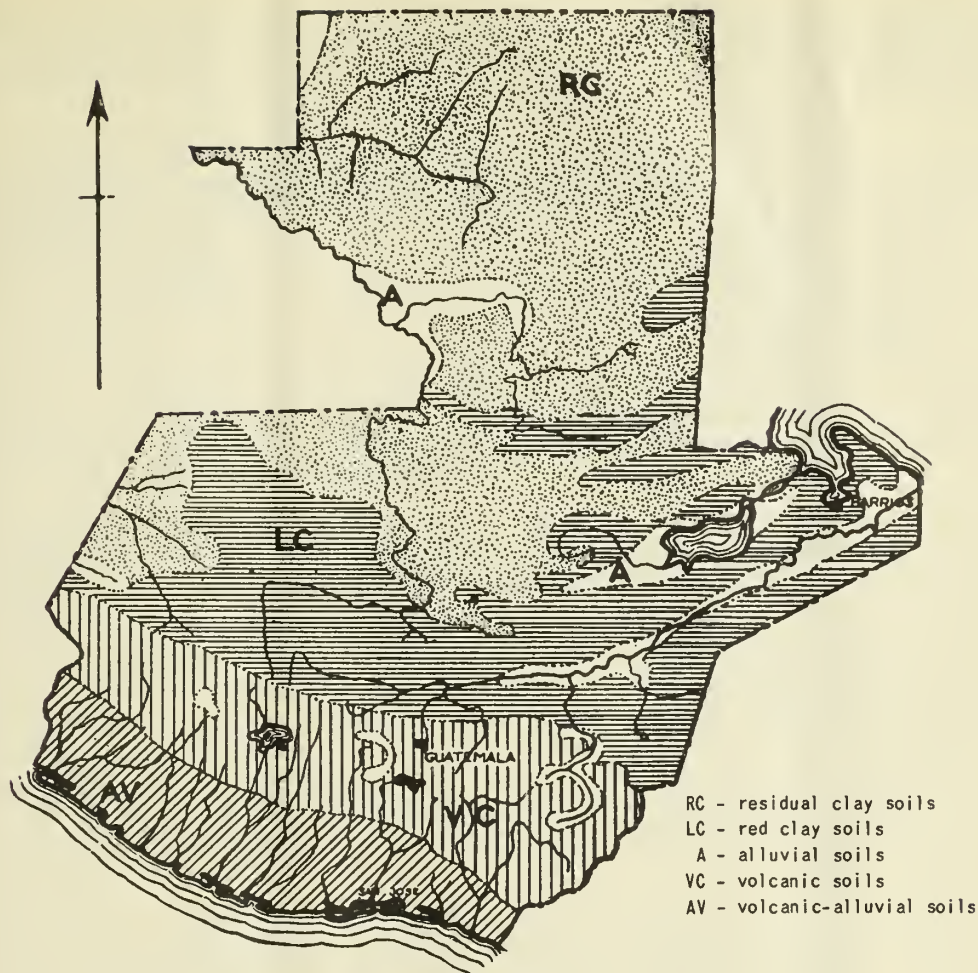


FIGURE 2.—Soil map of Guatemala.

Cinchona bark (from which quinine is made), rubber, palm nuts, and other strategic forest products found in Guatemala have become more important with the cutting off of normal sources of supply by the war.

Copper, lead, zinc, silver, and antimony exist in various sections of the country, but chromite, lead, sulfur, and gold are the only minerals exploited.

#### THE AGRICULTURAL PATTERN

Of the staple food crops, Guatemala produces enough for its own needs of all but wheat. From 1937 through 1941, 48 percent of the total wheat needs were imported in the form of wheat flour, and 8 percent of the lard requirements came from abroad (3). Imports of the other staple foods, however, represented less than 1 percent of total disappearance (table 1).

In addition to the lard imported, however, 102,000 pounds of olive oil, 207,000 pounds of other vegetable oils, and 701,000 pounds of vegetable compounds and shortening were imported. While Guatemala buys a variety of other foodstuffs from outside its borders, wheat flour and fats and oils are the only important deficits in staple foods.

In common with many other Latin American countries Guatemala depends almost exclusively on agriculture, and more than 90 percent of its exports are of agricultural products. Seventy-three percent of the population is rural, and of the economically active males 84 percent were engaged in agriculture during 1940.

TABLE 1.—*Production, trade, and apparent domestic disappearance of selected staple foods, average 1937-1941*

COMMODITY	UNIT	PRODUCTION	NET IMPORTS	NET EXPORTS	APPARENT DOMESTIC DISAPPEARANCE	IMPORTS AS PERCENT OF DISAPPEARANCE
<i>:Thousands:</i>						
Corn .....	Bushels :	15,581 :	52 :	- :	15,633 :	(1)
Beans (frijoles) ..	Pounds :	107,849 :	- :	128 :	107,721 :	-
Wheat .....	Bushels :	534 :	488 :	- :	1,022 :	48
Sugarcane: White sugar,	Short tons:	18 :	- :	2 :	16 :	-
Panela ..	Short tons:	38 :	- :	- :	38 :	-
Rice .....	Pounds :	20,147 :	42 :	- :	20,189 :	(1)
Potatoes .....	Bushels :	481 :	1 :	- :	482 :	(1)
Lard <sup>2</sup> .....	Pounds :	5,694 :	473 :	- :	6,167 :	8
	:	:	:	:	:	:

<sup>1</sup> Less than 0.5 percent.

<sup>2</sup> Based on consumption data average 1938-1941.

Despite the importance of agriculture in the total economy, however, only a small portion of the land area is cultivated. In the crop year 1940-41, for example, only about 2,600,000 acres of the land (10 percent) were in either crops or cultivated pastures (table 2). Another 700,000 acres were in permanent pastures, and approximately 1,500,000 acres were in forest (not including national lands).

Only a small proportion of the total land area is owned by individuals, and most of such privately owned land is held in large blocks by a few persons (6). Much of the government-owned land, however, is inaccessible, or uncultivable, and in some cases is utilized by the Indians either as rent-free homesteads or to supplement their own small plots. The holdings of the small landowner in the more thickly settled mountainous territory produce a bare living for the farm family with little or nothing left over for sale.

Corn is the principal item of diet, supplemented with beans, panela (a kind of brown sugar), wheat, rice, potatoes, and a few fruits and vegetables. The two major export crops, coffee and bananas, furnish exchange for the purchase of needed articles from abroad.

### FOOD CROPS

Corn is grown in all Departments of the Republic, although Alta Verapaz is the most important producer (table 2). Many students believe that Indian corn or maize was first found in the valleys of Guatemala. It is not only the present mainstay of the diet but has been since long before the conquest. Indian women use corn for bread, tortillas, meal, tamales, and "atole" or gruel. Half of the total cultivated area is in corn, almost four times the area devoted to coffee. Both acreage and production show a steady upward trend, the 1942 production reaching 27,000,000 bushels (table 3).

Corn is a small-farm crop in Guatemala, grown by hand cultivation in small patches on the hillsides where the use of modern machinery would be difficult even if it were available. Because of the great variety of climate and elevation, many kinds of corn are grown. There are great differences in size of ear, yield, shape of the kernels, and color, which runs from white through red, orange, yellow, blue, and black. Yields are low, and little effort is made to improve them. Corn produced in the lowlands is usually harvested in September and that in the highlands in November. The farmers raise corn only for their own needs and to supply the local village market. They do not regard it as a commercial crop.



TABLE 2.-Cultivated area of principal crops in Guatemala, by political divisions, 1940-41

POLITICAL DIVISIONS	CORN	COFFEE	BEANS	BANANAS	WHEAT	SUGARCANE	RICE	POTATOES	CULTIVATED PASTURES	TOTAL
: Acres :	: Acres :	: Acres :	: Acres :	: Acres :	: Acres :	: Acres :	: Acres :	: Acres :	: Acres :	: Acres :
Alta Verapaz .....	125,736:	29,649:	17,123:	5,562:	- :	3,042:	985:	600:	126:	182,823
Baja Verapaz .....	45,861:	2,524:	8,309:	36:	2:	904:	480:	184:	667:	58,967
Chimaltenango .....	68,660:	22,123:	17,251:	363:	5,160:	1,157:	320:	939:	780:	116,753
Chiquimula .....	39,336:	1,192:	7,904:	116:	1:	1,493:	1,159:	148:	2,349:	53,698
Escuintla .....	45,932:	20,952:	5,605:	21,504:	- :	12,706:	415:	(1) :	131,890:	239,004
Guatemala .....	85,872:	11,048:	13,582:	304:	10:	1,642:	297:	641:	8,362:	121,758
Huehuetenango .....	86,595:	2,708:	10,454:	94:	7,413:	2,832:	196:	1,729:	362:	112,383
Izabal .....	29,756:	103:	2,527:	19,333:	- :	35:	174:	2:	1,267:	53,197
Jalapa .....	71,391:	845:	11,513:	30:	360:	568:	1,039:	532:	1,893:	88,171
Jutiapa .....	53,343:	1,580:	10,358:	57:	3:	1,761:	8,363:	542:	47,735:	123,742
Petén .....	14,712:	33:	2,557:	17:	- :	188:	45:	1:	317:	17,870
El Progreso .....	42,840:	125:	8,457:	61:	- :	1,539:	214:	123:	1,672:	55,031
Quezaltenango .....	82,853:	44,979:	9,006:	8,068:	15,358:	1,966:	1,107:	2,014:	59,788:	225,139
Quiché .....	75,774:	1,304:	10,786:	35:	664:	962:	136:	648:	15:	90,324
Retalhuleu .....	45,013:	26,854:	1,938:	6,512:	- :	2,590:	1,237:	68:	70,265:	154,477
Sacatapéquez .....	42,710:	5,094:	9,874:	1:	31:	530:	14:	358:	3,563:	62,175
San Marcos .....	94,385:	60,879:	10,247:	4,811:	14,833:	1,751:	1,302:	2,590:	56,805:	247,603
Santa Rosa .....	65,465:	27,799:	9,613:	184:	179:	4,332:	4,689:	846:	77,141:	190,248
Sololá .....	37,677:	3,417:	5,191:	153:	3,360:	345:	30:	235:	20:	50,428
Suchitepéquez .....	47,480:	54,644:	2,150:	13,036:	- :	5,543:	5,279:	122:	35,530:	163,784
Totonicapán .....	22,584:	- :	4,872:	- :	5,458:	- :	- :	261:	12:	33,187
Zacapa .....	32,460:	2,155:	5,817:	151:	- :	1,200:	461:	61:	6,069:	48,374
Total .....	1,256,435:	320,007:	185,134:	80,428:	52,832:	47,086:	27,942:	12,644:	506,628:	2,489,136
Other cultivations reported (see table 4)	:	:	:	:	:	:	:	:	:	:
Total reported cultivation, including pasture										104,530
Total area										2,593,666
Cultivated area as percent of total area										24,320,000 to 30,720,000 10.7 to 8.4

1 Less than 0.5 acre.

Memoria de las Labores del Ejecutivo en el Ramo de Agricultura 1941, Guatemala, 1942.

TABLE 3.-Area and production of principal crops in Guatemala, 1927-42

YEAR	CORN			COFFEE			BEANS			BANANAS		
	ACREAGE	PRODUCTION		ACREAGE	PRODUCTION		ACREAGE	PRODUCTION		ACREAGE	PRODUCTION	
1927-28	1,000 acres	1,000 bushels		1,000 acres	1,000 pounds		1,000 acres	1,000 pounds		1,000 acres	1,000 stems	
1928-29	271.4	3,712		180.5	116,079		23.8	10,791		60.4	6,407	
1929-30	344.5	5,078		238.9	91,876		29.7	14,709		54.4	8,827	
1930-31	420.8	6,225		267.6	98,705		31.9	15,376		61.5	9,858	
1931-32	364.7	5,291		251.7	91,220		30.9	16,270		43.2	4,986	
1932-33	366.7	5,729		344.7	121,715		26.6	16,531		39.1	6,219	
1933-34	334.7	5,533		252.2	111,573		24.5	14,675		29.5	4,656	
1934-35	351.5	5,159		254.7	116,936		24.6	13,128		21.7	6,923	
1935-36	346.2	5,569		263.2	94,374		27.8	17,678		117.5	8,847	
1936-37	339.9	5,941		268.2	123,587		27.4	17,744		40.7	9,475	
1937-38	697.3	11,198		277.0	127,409		95.1	82,947		52.1	11,534	
1938-39	772.8	11,268		295.0	124,687		121.3	81,213		81.0	10,723	
1939-40	834.7	12,716		278.1	118,615		149.9	99,460		83.2	14,354	
1940-41	957.6	18,149		275.1	115,605		183.7	128,622		85.9	12,850	
1941-42	1,256.4	24,573		320.0	114,418		185.1	147,003		80.4	10,118	
	1,300.5	27,045		(1)	(1)		182.8	159,476		(1)	(1)	

YEAR	WHEAT			SUGARCANE			RICE 2			POTATOES		
	ACREAGE	PRODUCTION		ACREAGE	PRODUCTION		ACREAGE	PRODUCTION		ACREAGE	PRODUCTION	
1927-28	1,000 acres	1,000 bushels		1,000 acres	1,000 short tons		1,000 acres	1,000 pounds		1,000 acres	1,000 bushels	
1928-29	17.7	167		27.1	18		3.0	2,477		1.6	46	
1929-30	17.7	152		29.9	33		2.9	2,578		1.6	52	
1930-31	23.1	189		31.1	63		5.0	4,274		1.5	48	
1931-32	15.8	137		31.5	16		4.8	3,680		3.9	47	
1932-33	14.3	200		27.0	14		5.7	5,683		1.8	59	
1933-34	16.5	193		22.3	11		4.8	4,457		2.3	57	
1934-35	17.2	139		20.4	11		5.3	5,488		1.5	49	
1935-36	18.4	171		18.8	13		8.1	5,860		1.7	57	
1936-37	23.0	230		20.9	15		4.7	5,235		2.1	66	
1937-38	49.6	573		33.6	17		13.5	14,408		7.4	426	
1938-39	42.0	391		39.0	16		20.2	14,652		11.4	437	
1939-40	44.3	481		37.2	17		23.9	18,143		12.1	471	
1940-41	47.9	559		37.5	18		25.3	26,621		13.2	515	
1941-42	52.8	665		47.1	21		27.9	26,912		12.6	556	
	61.8	820		(1)	23		29.5	29,788		13.2	666	

1 Not yet available.

2 Milled rice.

Memoria de las Labores del Ejecutivo en el Ramo de Agricultura, 1941, Guatemala 1942; Consular report No. 53, June 10, 1943, from Guatemala.

~~~

Beans are produced in all Departments also, but cultivation is concentrated largely in the central and southeastern Departments. As in the case of corn, beans supply domestic needs and are of little importance commercially, although in 1941, 630,000 pounds were exported, mainly to El Salvador.

Sugarcane acreage is scattered over the Republic, but the Department of Escuintla on the Pacific coast is the principal producer of both white sugar and panela. In the middle of the nineteenth century sugar promised to become one of the major exports, but during most of the twentieth century it has been primarily a subsistence crop. Production has increased steadily since 1932, however, and more than 3,000 short tons of sugar were exported in 1942. A Confederation of Sugar Growers controls prices under the general supervision of the Department of Agriculture.

The Departments of Quezaltenango and San Marcos are the principal wheat producers. Because of its climatic requirements, wheat is a highland crop in tropical areas; consequently, in Guatemala it is localized in the western part of the country. Consumption of wheat flour, on the other hand, is concentrated in areas where the foreign population and descendants of European stock are located - particularly the Departments of Guatemala and Izabal. Most wheat farmers operate small farms, varying between 2 and 60 acres, and few use modern methods of cultivation (8). In the customary rotation pattern wheat is grown 2 or 3 years; then after one year of fallow the vegetation is plowed under as green manure. Experimentation is going on to determine the varieties of wheat best suited to soil and climatic conditions in Guatemala.

The other food crops are much less important. Rice production is heaviest in Jutiapa, Suchitepéquez, and Santa Rosa, all southern Departments. Seeding begins the first of May and lasts through the end of June. The harvest from the May seeding is called winter rice and yields a larger product, although the grains are less white; whereas the harvest from the June seeding, summer rice, is smaller, but the grain is whiter (2). The highland regions of the western Departments of San Marcos, Huehuetenango, and Quezaltenango produce potatoes. Some quantities of both these products are imported, but they make up only a minor part of the total supply. Twelve years ago rice imports amounted to about 4,000,000 pounds a year; but, as a result of government encouragement of production, imports have declined sharply and in 1941 amounted to less than 11,000 pounds.

Vegetables, bananas, and other fruits are grown for local use, but except for bananas there is little foreign trade in any of these items. Apples, oranges, peaches, and other Temperate Zone and semitropical fruits grow in Guatemala as well as tropical fruits, such as the papaya, mango, and avocado.

### Export Crops

Important exports shifted gradually from cacao and dyestuffs (indigo and cochineal) in colonial times to coffee and later to bananas. With the invention of chemical dyes in the latter part of the nineteenth century, producers of vegetable dyes turned to sugar, tobacco, grains, and coffee. The market for coffee developed most rapidly, however, and it soon took the lead in export value. By 1900 production had reached 80,000,000 pounds, and it has fluctuated between 80,000,000 and 125,000,000 pounds in most years since then. The 1940-41 production was 114,000,000 pounds.

Compared with corn, coffee is a large-farm enterprise in Guatemala, and before the present war both production and exports were controlled largely by foreign owners. In the crop year 1935-36, for example, 64 percent of the coffee exported was under German control (6); American, 18; Netherland, 7; Guatemalan, 5; British, 4; and other, 2.





FIGURE 3.—Blooming coffee plant on the farm, "San Agustín Las Minas," of the President. (Courtesy of Revista Agrícola.)

Coffee of the best quality grows in the mountain valleys and on the hillsides. More than a quarter of the country's production is in the Department of San Marcos and almost 60 percent in the three Departments of San Marcos, Quezaltenango, and Suchitepéquez (fig. 4).

The coffee plants, which are first grown in nurseries, are set out in their permanent location when they are 2 or 3 feet high and are grown under shade to protect them from the sun. The machete and azadón or hoe are used in cultivation, and the machete in pruning the trees. Coffee ripens the year round, but the largest harvest is in November and December. The ripe berries are picked by hand and are kept in water for 2 or 3 days before the pulp is removed. They are then dried in the open air for from 8 to 20 days before being hulled. The hulled beans are classified carefully and polished to obtain a superior

product. A few of the larger farms are equipped with mechanical washers and dryers.

Most of Guatemala's coffee is grown for export. Before the first world war Germany took 60 percent of these exports. Since then, however, the United States has been the principal market, although Germany was again important during the 1930's. Since the present war began, the United States has taken more than 90 percent of total shipments.

When the International Coffee Agreement was signed in November 1940, Guatemala was given a basic quota for the United States market of 535,000 bags of 60 kilos for the 1940-41 quota year beginning October 1, and a basic quota of 312,000 bags for markets outside the United States. After several revisions of the quota the final figure for the United States market was increased to 558,893 bags (6). This quantity compares with an average of 434,006 bags shipped to the United States during the 3 years 1937-39. The final quota for the 1941-42 year was fixed at 793,042 bags, and the quota for 1942-43, as of August 9, was set at 944,832 bags.

In order to conform to the terms of the Coffee Agreement, each plantation in Guatemala was allotted a quota for export to the United States market of 75 percent of its production from October 1, 1940, through September 30, 1941. The Central Coffee Office of the Department of Agriculture was charged with administering the quota. Because of the difficulties encountered with this method of allocation, and to ensure a more effective system, a Coffee Advisory Board (Junta Asesora de Café) was established in July 1941, and the Central Coffee Office was reorganized. In addition to administering a quota scheme, the Board was concerned with the problem of disposing of the coffee produced on plantations of German nationals. An arrangement was finally



made whereby the United States agreed to accept 20 percent of this coffee under Guatemala's quota provided it was purchased through the Central Bank and the proceeds placed in a blocked account.

Bananas, the other important export item, are also under the control of foreign interests - one large American company has almost exclusive control over all banana exports. The fruit is produced in the coastal regions, formerly centering on the north coast in the Department of Izabal. During the past 5 years, however, the Pacific-coast plantations have increased in importance (table 2). While Izabal still produced more bananas in 1940-41 than did any other Department - 3,400,000 stems - the Pacific-coast Departments together (San Marcos, Quezaltenango, Retalhuleu, Suchitepéquez, and Escuintla) produced 6,200,000 stems. The Company had almost 33,000 acres under cultivation in 1942, 15,000 on the Atlantic and 18,000 on the Pacific coast. Many small producers also raise the fruit for sale to the company and for home use. The total area in bananas approximates 80,000 acres.

The industry suffers from "blow-downs," the Panama and sigatoka diseases, and, at present, from the loss of export outlets because of shipping difficulties. The fruit company has installed overhead spraying equipment through which a copper-sulfate solution can be sprayed onto the plants to check the spread of disease.

Equipment has also been installed by which the Guatemala banana fields are now watered in the dry season by overhead irrigation. Pipes extend from central pumping stations to large metal stands located at intervals

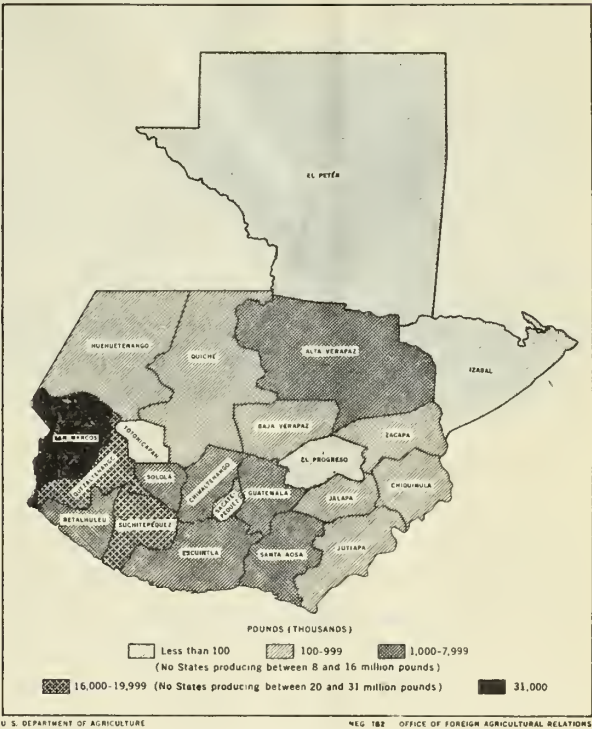


FIGURE 4.—Coffee production in Guatemala, 1940-41.

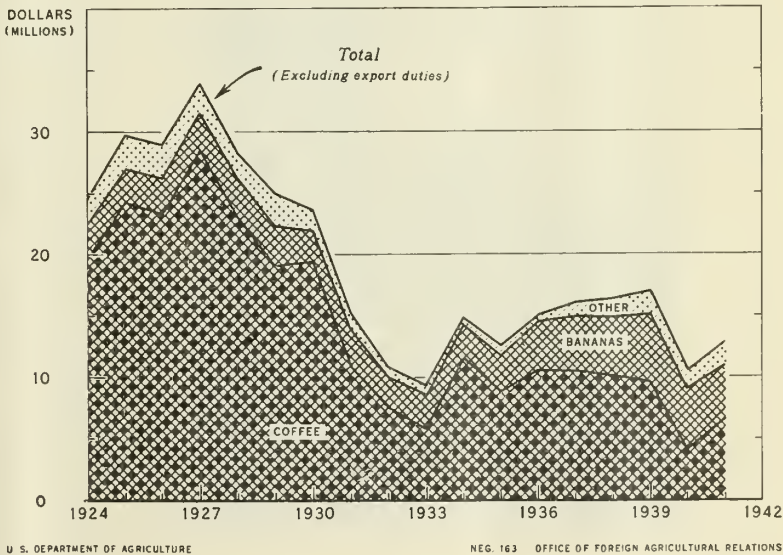


FIGURE 5.—Value of coffee, bananas, and total exports from Guatemala, 1924-1941.



FIGURE 6.—Fruit exhibits, Guatemala City. (Courtesy of The National Tourist Committee of Guatemala.)

a machete and the stems are piled along the roads. A truck delivers the fruit to the loading platform, where the stems are counted and "dunked" first in a solution of muriatic acid to remove the copper-sulfate coating and then into fresh water to remove the acid. After they leave the fresh water each stem is wrapped in a blanket made of paper lined with wool and loaded onto the freight cars for the rail trip to port.

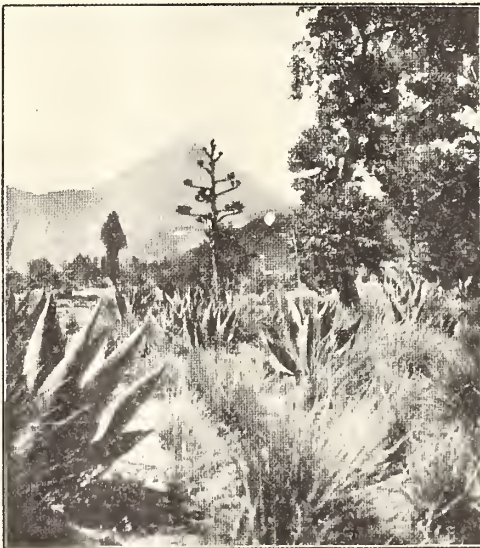


FIGURE 7.—Agave and zacaton growing in the Department of Quezaltenango. (Courtesy of Revista Agrícola.)

throughout the fields. A revolving apparatus on top of the stands sends water over 3.25 acres of bananas at a time and supplies them with 2 inches of water a week during the dry season. Both the installation and upkeep expenses of spraying and irrigation are high, and the small independent producers keep their plants watered and free of disease only with help from the fruit company. Necessary fertilizer further increases the cost of production.

When the fruit is ready for harvest, it is cut with a machete and the stems are piled along the roads. A truck delivers the fruit to the loading platform, where the stems are counted and "dunked" first in a solution of muriatic acid to remove the copper-sulfate coating and then into fresh water to remove the acid. After they leave the fresh water each stem is wrapped in a blanket made of paper lined with wool and loaded onto the freight cars for the rail trip to port.

Puerto Barrios on the north (Atlantic) coast remains the chief port of shipment, even though production along the Pacific has jumped ahead rapidly. Most of the fruit from the south (Pacific) coast moves by rail across the country to be loaded on the boats at Puerto Barrios. In recent months a few bananas have traveled by rail from Guatemala through Mexico to the United States markets.

Shipping difficulties are now the greatest threat to the industry. Exports dropped from a peak of 10,400,000 stems in 1939 to 5,000,000 stems (of 50 pounds each) in 1942. The United States always has taken most of Guatemala's bananas, although before the present war the United Kingdom, Germany, and the Netherlands together imported from 200,000 to 600,000 stems a year.



TABLE 4.—Area and production of all crops recorded, 1940-41

| ITEM                              | AREA     | PRODUC-<br>TION | ITEM                      | AREA     | PRODUC-<br>TION |
|-----------------------------------|----------|-----------------|---------------------------|----------|-----------------|
|                                   | : 1,000  | : 1,000         |                           | : 1,000  | : 1,000         |
|                                   | : acres  | : pounds        |                           | : acres  | : pounds        |
| Corn .....                        | 1,256.4: | 24,573:         | Tobacco .....             | 2.8:     | 2,021           |
| Coffee .....                      | 320.0:   | 114,418:        | Tomatoes .....            | 2.1:     | 9,446           |
| Coffee acreage not in production: | 25.4:    | :               | Oats .....                | 1.4:     | 127             |
| Beans (frijoles) .....            | 185.1:   | 147,003:        | Peanuts .....             | 1.1:     | 1,013           |
| Bananas .....                     | 80.4:    | 210,118:        | Maguay .....              | .9:      | 1,173           |
| Wheat .....                       | 52.8:    | 1665:           | Malanga .....             | .9:      | 1,055           |
| Sugarcane: white sugar .....      | 47.1:    | {               | Rubber .....              | .8:      | 316             |
| Panela .....                      |          |                 | Barley .....              | .8:      | 19              |
| Rice (milled) .....               | 27.9:    | 26,912:         | Oil of lemon .....        | .7:      | 147             |
| Banana (Guineo) .....             | 16.7:    | 23,233:         | Sweetpotatoes .....       | .7:      | 1,435           |
| Potatoes .....                    | 12.6:    | 556:            | Sesame .....              | .5:      | 484             |
| Lima beans .....                  | 8.0:     | 6,953:          | Cardamon .....            | .5:      | 123             |
| Ayote .....                       | 7.4:     | 30,518:         | Chickpeas .....           | .2:      | 182             |
| Cotton .....                      | 6.1:     | 44:             | Henequen .....            | .1:      | 77              |
| Plantains .....                   | 5.3:     | 21,287:         | Soybeans .....            | (5):     | 15              |
| Yuca .....                        | 3.8:     | 17,459:         | Vegetables .....          | 612.4:   |                 |
| Chili .....                       | 3.4:     | 2,332:          | Cultivated pastures ..... | 506.6:   |                 |
| Cacao .....                       | 2.8:     | 1,833:          | Total .....               | 2,593.7: |                 |
|                                   | :        | :               |                           | :        | :               |

1 Bushels. 2 Stems. 3 Short tons. 4 Bales of 478 pounds. 5 Less than 50.

6 Acreage in 1939-40 of 15 vegetables not listed above.

Memoria de las Labores del Ejecutivo en el Ramo de Agricultura 1941, Guatemala, 1942.

### Other Crops

Crops which at present are of minor importance in the economy but which promise to develop into more important industries include cotton, rubber, sesame, oil palms, henequen, essential oils, rubber, cinchona (quinine) and other medicinal plants. (See table 4.)

### Livestock

The Spanish conquerors brought cattle and other livestock with them to the new world, and in Guatemala these animals soon supplied most of the meat eaten in the country. Descendants of these early stocks, known as criollos, are poor in quality although an effort has been made to improve the strains by introducing purebred stock. The Breed Register of Dairy Animals, set up in the Department of Agriculture, is encouraging scientific breeding and feeding. Domestic livestock continue, however, to supply most of the home market for animal products, except lard and tallow (for industrial use), as well as to furnish cattle hides for export.

Net imports of live cattle from 1937 through 1941 averaged only 9,000 head a year, and average net imports of meat (in 1,000 pounds) were as follows: Fresh, chilled, and frozen, 18; ham and bacon, 57; other cured and salted meat, 39.

Exports of cattle hides during this same period averaged 819,000 pounds a year. In addition, the domestic cheese production of more than 2,000,000 pounds a year and butter production of 850,000 pounds supplied from 93 to 97 percent of the home market. Production of both butter and cheese increased in 1942.

Cattle account for the greater part of the livestock produced; the number on farms in 1942 totaled 630,000 (table 5). Slaughter has fluctuated between 105,000 and 127,000 head in recent years, and the weight of the slaughter from 1938 through 1941 averaged 375 pounds per head.

The cattle-producing Departments are in the west, Escuintla being the most important. Sheep are concentrated in the highlands, and hogs are scattered throughout the Republic. The cultivated pasture acreage indicates the location of the cattle industry (table 2).

TABLE 5.—Number of livestock on farms in Guatemala, 1938-42

| LIVESTOCK    | 1938       | 1939       | 1940       | 1941       | 1942       |
|--------------|------------|------------|------------|------------|------------|
|              | 1,000 head | 1,000 head | 1,000 head | 1,000 head | 1,000 head |
| Cattle ..... | 532        | 520        | 605        | 612        | 630        |
| Hogs .....   | 163        | 155        | 258        | 276        | 290        |
| Sheep .....  | 241        | 281        | 378        | 383        | 435        |
| Goats .....  | 22         | 51         | 43         | 44         | (1)        |

<sup>1</sup> Not yet available.

Beekeeping is an important occupation, and honey is one of the principal minor exports. In 1941 beehives, totaling 48,000, produced 1,500,000 pounds of honey and 77,000 pounds of beeswax. Production increased in 1942 to more than 2,000,000 pounds of honey and 108,000 pounds of beeswax.

### FOREIGN TRADE

Although the per capita value of its foreign trade is small, Guatemala is the most important commercial nation of Central America, accounting for from one-fourth to one-third of the total value of all the trade of the six Republics. The value of both imports and exports varies with the general business cycle, although the 1941 trade did not increase in proportion because of wartime shipping and market difficulties.<sup>2</sup> The 1942 export value, however, was the highest reached since 1930.

Because of war conditions, the United States is sharing more and more in Guatemalan trade. The United States took only a third of the total exports (value), for example, in the early 1930's, when Germany took almost as large a share, and from a half to two-thirds of the total in the later 1930's. In 1940, 1941, and 1942, however, the United States took more than 90 percent of the total exports. It also furnished from 40 to 50 percent of the total imports (value) during the decade of the 1930's and Germany from 20 to 35 percent. Three-quarters of the 1940 and 1941 imports and 70 percent of the 1942 imports, however, came from the United States, and Germany, of course, had disappeared from the trade entirely, as had the Netherlands. Western Hemisphere countries, especially Canada, Peru, and Mexico, have accounted for more and more of the trade in recent months.

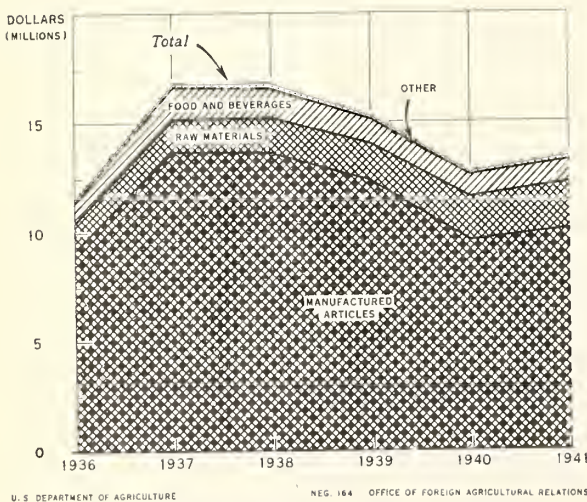


FIGURE 8.—Imports into Guatemala by commodity groups.

### Composition of Trade

Coffee, bananas, and chicle make up more than 90 percent of the value of total exports (fig. 5). Of these, coffee used to be the undisputed leader, but during the

<sup>2</sup> A different system of evaluating coffee was set up in 1940 - actual invoice values being used instead of the former arbitrary valuation of \$10 per quintal. Had the former method been employed, the total export value would have been increased by about \$4,000,000. A new basis of valuation for all exports, also adopted in 1940, provides that export duties be added to invoice values to obtain total export value.



TABLE 6.—Principal exports from Guatemala, volume and value,<sup>1</sup> 1937-42

| EXPORTS                 | 1937            |                  | 1938            |                  | 1939            |                  |
|-------------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
|                         | QUANTITY        | VALUE            | QUANTITY        | VALUE            | QUANTITY        | VALUE            |
|                         | 1,000<br>pounds | 1,000<br>dollars | 1,000<br>pounds | 1,000<br>dollars | 1,000<br>pounds | 1,000<br>dollars |
| Coffee (clean) .....    | 103,534         | 10,503           | 107,031         | 10,016           | 96,381          | 9,522            |
| Coffee (pergamino) .... | 327             | 22               | 1,077           | 74               | 380             | 30               |
| Bananas .....           | 28,727          | 4,302            | 29,635          | 4,748            | 210,417         | 5,482            |
| Chicle .....            | 1,311           | 306              | 1,712           | 514              | 2,170           | 775              |
| Wood .....              | 31,332          | 106              | 3848            | 92               | 31,784          | 214              |
| Essential oils .....    | 176             | 62               | 183             | 54               | 276             | 68               |
| Cattle hides .....      | 1,086           | 77               | 1,137           | 80               | 834             | 116              |
| Honey .....             | 2,386           | 95               | 2,594           | 158              | 2,261           | 121              |
| Total value .....       |                 | 15,473           |                 | 15,736           |                 | 16,328           |
| Value of all exports:   |                 | 16,109           |                 | 16,336           |                 | 16,985           |
|                         | 1940            |                  | 1941            |                  | 1942            |                  |
| Coffee (clean) .....    | 91,552          | 4,066            | 92,088          | 6,557            | 109,837         | 13,637           |
| Coffee (pergamino) .... |                 |                  |                 |                  |                 |                  |
| Bananas .....           | 28,306          | 5,018            | 26,956          | 4,258            | 25,031          | 3,264            |
| Chicle .....            | 1,526           | 528              | 2,870           | 1,014            | 3,538           | 1,426            |
| Wood .....              | 1,436           | 106              | 1,960           | 237              | 32,397          | 278              |
| Essential oils .....    | 318             | 92               | 257             | 153              | 264             | 329              |
| Cattle hides .....      | 453             | 42               | 586             | 68               | 797             | 87               |
| Honey .....             | 664             | 98               | 404             | 18               | 2,444           | 112              |
| Total value .....       |                 | 9,950            |                 | 12,305           |                 | 19,133           |
| Value of all exports:   |                 | 10,421           |                 | 12,785           |                 | 20,438           |

<sup>1</sup> Includes export taxes.<sup>2</sup> Stems of 50 pounds each.<sup>3</sup> Feet.

Memoria de las Labores del Poder Ejecutivo en el Ramo de Hacienda y Crédito Público, 1937-41. Consular report No. 53 of June 10, 1943, from Guatemala.

1930's and until shipping became congested, bananas were pushing ahead and in 1940 jumped into first place (table 6). Honey, cattle hides, zacaton root, and woods, including mahogany, are exported in important quantities, and in the past 2 years cinchona (quinine), rubber, and other strategic products have entered trade channels.

Imports are confined largely to manufactured articles, including cotton textiles, railway material, automobiles, gasoline, naphtha, petroleum, paper, cardboard and manufactures, and pneumatic tires (fig. 8). Among the agricultural imports wheat flour is the most important, followed by lard, dairy products, vegetable fats and oils, and a variety of processed foods.

### Trade with the United States

The United States is the most important country with which Guatemala trades, and it is becoming increasingly important as the war shuts off more and more non-Hemisphere trade. Bananas, coffee, and chicle, the three largest export items from Guatemala, furnish a substantial share of United States requirements for these products (table 7). Guatemala ranks second to Mexico only as a supplier of chicle and is the third most important source of bananas and mild coffee. Wood and essential oils are other important import products from Guatemala.

TABLE 7.—Principal United States imports from Guatemala, 1938-40

| IMPORTS               | 1938            |                  | 1939            |                  | 1940            |                  |
|-----------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
|                       | QUANTITY        | VALUE            | QUANTITY        | VALUE            | QUANTITY        | VALUE            |
|                       | 1,000<br>pounds | 1,000<br>dollars | 1,000<br>pounds | 1,000<br>dollars | 1,000<br>pounds | 1,000<br>dollars |
| Bananas .....         | 19,175          | 4,594            | 19,588          | 5,234            | 18,227          | 5,059            |
| Coffee .....          | 59,910          | 4,094            | 56,368          | 4,332            | 80,319          | 5,105            |
| Chicle .....          | 1,623           | 532              | 2,051           | 697              | 1,437           | 414              |
| Total value .....     |                 | 9,220            |                 | 10,263           |                 | 10,578           |
| Value of all imports: |                 | 9,529            |                 | 10,721           |                 | 11,083           |

<sup>1</sup> 1,000 stems.

Compiled from official sources.

TABLE 8.—Principal agricultural products exported from the United States to Guatemala, 1939 and 1940

| EXPORTS                                                     | UNIT     | 1939      |                  | 1940     |                  |
|-------------------------------------------------------------|----------|-----------|------------------|----------|------------------|
|                                                             |          | QUANTITY  | VALUE            | QUANTITY | VALUE            |
|                                                             |          |           | 1,000<br>dollars |          | 1,000<br>dollars |
| Flour from United States wheat .....                        | Barrels: | 95,654    | 326,109          | 68,932   | 265,948          |
| Flour from other wheat .....                                | Barrels: | 13,329    | 51,389           | 18,633   | 77,920           |
| Lard .....                                                  | Pounds:  | 687,251   | 46,676           | 323,517  | 20,652           |
| Vegetable fats and oils .....                               |          |           | 51,834           |          | 32,902           |
| Dairy products .....                                        |          |           | 68,030           |          | 55,763           |
| Oatmeal .....                                               | Pounds:  | 549,473   | 31,467           | 375,212  | 20,757           |
| Other food products .....                                   |          |           | 222,131          |          | 256,790          |
| Total food value .....                                      |          |           | 797,636          |          | 730,732          |
| Raw cotton .....                                            | Pounds:  | 1,179,158 | 109,725          | 618,445  | 63,616           |
| Vegetable oils, inedible .....                              | Pounds:  | 139,947   | 10,611           | 599,523  | 26,406           |
| Total value .....                                           |          |           | 917,972          |          | 820,754          |
| Total value all United States exports<br>to Guatemala ..... |          |           | 8,510,126        |          | 9,039,380        |

Compiled from official sources.

Wheat flour is usually the most valuable single item exported from the United States to Guatemala, although textiles, petroleum products, machinery and tools, and chemical and pharmaceutical products are as important as the food group (table 8). Other agricultural items that the United States supplies include lard, vegetable fats, dairy products, and raw cotton.

The Reciprocal Trade Agreement between the United States and Guatemala, effective June 15, 1936, provided reductions of from one-fourth to one-half in Guatemala's import duties on 14 items and bindings against increase in duty on 52 others. The United States bound on the freelist bananas, plantains, coffee, deerskins, and cabinet woods in the log and reduced the duty on honey, pineapples, guavas, and on mango and guava pastes and pulps.

### GOVERNMENT POLICIES AND PLANS FOR AGRICULTURE

Although an Agrarian Law was enacted in 1894, agriculture did not have a separate Department in the Government until 1920. The present Government desires to expand agricultural production and realizes the need for trained technical personnel to plan and carry out new programs.

#### Government Assistance

One of the principal means of government assistance to agriculture is through provision of credit. The Central Bank, established in 1926, makes short- and medium-term loans secured by agricultural products and livestock; the Crédito Hipotecario, a mortgage bank set up in 1930, must give preference to agricultural borrowers in using the first two-thirds of its authorized capital; and the Banco Agrícola Hipotecario, a private bank established in 1894 but now under government control, makes a few agricultural loans. In addition, private business houses hold loans secured by agricultural and livestock products. Of the loans outstanding, however, the Central Bank holds the major part. The Government has reduced interest rates and provided loan funds for the purchase of seed, fertilizer, and machinery for planting, cultivating, and harvesting the crops.

*Distribution of agricultural loans outstanding March 31, 1942, by banking agency*  
Percent of total

|                                  |       |
|----------------------------------|-------|
| Central Bank .....               | 84.1  |
| Crédito Hipotecario .....        | 4.0   |
| Banco Agrícola Hipotecario ..... | 1.1   |
| Private business firms .....     | 10.8  |
|                                  | 100.0 |

Since colonial days the Government has experimented with different colonization measures designed to increase agricultural production by settling more people on the land. Difficulties surrounding land titles and the inaccessibility of much of the public land retarded successful development. In 1927 a new plan for settling colonists on vacant lands was announced, and a National Agrarian and Colonization Office was established to administer the plan. Progress continued to be slow, and in 1934 a new series of decrees authorized free grants of land to farmers in order to speed up colonization. Seeds, tools, and transportation of the settlers were provided if necessary.

A new Agrarian Law (Decree No. 1784) was signed in February 1936, which placed limits on the amount of land that could be appropriated to an individual, depending on the size of his family, and set the price per unit of land, according to the use to which the land was to be put (4).

The present Government in 1934 also did away with the system of debt slavery whereby laborers were forced to work for those to whom they owed money. Under existing laws rural laborers<sup>3</sup> must work on their own ac-

count, either a prescribed number of days under a labor contract or cultivate a certain area of their own, and each man must work two weeks on the roads or other public works.



FIGURE 9.—Indian farm in the lake and mountain country.

#### Plans for Expansion

Early in 1943 the President of the Republic instructed the Secretary of Agriculture to "mobilize the agricultural resources of the country in order to intensify the cultivation of items of prime necessity" and to take the necessary action to increase the production of corn, beans, rice, wheat, potatoes, yuca, vegetables, pork, poultry, eggs, and raw materials needed for the war.<sup>4</sup> The purpose of such increased production is to improve the diet of Guatemalans and to furnish food for export to the Canal Zone and the Caribbean deficit areas. To implement these instructions the Secretary of Agriculture sent notices to all the Department heads to meet with the heads of the municipalities, who in turn would get in touch with the farmers in their districts and encourage them to expand production.

An authorization also was issued permitting the use of communal or municipal lands by small farmers not having sufficient acreage of their own. A census of able-bodied

<sup>3</sup> The laws include many classes of persons from beggars to students not attending classes regularly, although farm laborers are most important.

<sup>4</sup> RANDOLPH, ARCHIBALD R. ENCOURAGEMENT GIVEN BY THE GUATEMALAN GOVERNMENT TO INCREASE AGRICULTURAL PRODUCTION. Cons. Rpt. 3804, 6 pp. 1943. [Hectographed.]



persons is to be taken to ensure that all agricultural laborers in good health shall work. Officials of the political subdivisions must report each month on the results of the new program.

A presidential order of March 27, 1943, provided for increased agricultural facilities, as well as for control of prices to prevent speculation and hoarding. Retail prices of foodstuffs have increased greatly during the past year. From April 1, 1942, to April 1, 1943, forexample, the price of black beans increased 75 percent and the price of corn 100 percent.

In addition to purely domestic measures to increase agricultural production, Guatemala is cooperating with the United States in its efforts to find Hemisphere sources for strategic commodities. Stands of cinchona in Guatemala, for example, are now larger than in any other Western Hemisphere country. Under a recent agreement announced by the Board of Economic Warfare, Guatemala agrees to export quinine-bearing bark to the United States.

A rubber agreement published September 10, 1942, provides that the United States Rubber Reserve Company will purchase until December 31, 1946, all rubber produced in Guatemala that is not needed for domestic use. The Guatemalan Government controls the rubber industry and has announced that during the period of hostilities only the Government may purchase crude rubber.

One group of essential commodities with which Guatemala is experimenting now is that of fats and oils. Guatemala imports fats and oils, although there are many oil palms in the country, and a great variety of annual crops can be produced for manufacturing vegetable-lard compound. The cohune palm grows on the Atlantic coast, the corozo palm on the Pacific, and the Africa oil palm on both coasts. The development of the African oil palm is better, however, on the southern coast. The production of sesame, which grows well on the warm humid coastal plains, increased from 183,000 pounds in 1939 to 5,773,000 pounds in 1942. The present production of peanuts amounts to about 1,000,000 pounds and of cottonseed, from 2,000,000 to 4,000,000 pounds. One of the prime needs, however, is machinery for expressing and refining the oil.

Other strategic crops whose production could no doubt be expanded include henequen, agave, zacaton-root fibers, and rotenone-bearing roots. Expansion in the production of such materials opens the way for increased trade, especially with the United States, and for an improvement in the domestic economy of the country.

#### LITERATURE CITED

- (1) GARCÍA SALAS, JORGE.  
1930. MEMORANDUM DEL AGRICULTOR GUATEMALTECO. 52 pp., illus.
- (2) [GUATEMALA] DIRECCIÓN GENERAL DE AGRICULTURA.  
1940. CULTIVO DEL ARROZ. [Guatemala] Dir. Gen. de Agr., Ed. 3, 7 pp.
- (3) [GUATEMALA] RAMO DE HACIENDA Y CRÉDITO PÚBLICO.  
1938-42. MEMORIA DE LAS LABORES DEL PODER EJECUTIVO EN EL RAMO DE HACIENDA Y CRÉDITO PÚBLICO. (1937-41) illus. Guatemala.
- (4) [GUATEMALA] SECRETARÍA DE AGRICULTURA.  
1936. LEY AGRARIA DE LA REPÚBLICA DE GUATEMALA. [Guatemala] Rev. Agr. 13: 629-634.
- (5) [GUATEMALA] SECRETARÍA DE HACIENDA Y CRÉDITO PÚBLICO.  
1942. QUINTO CENSO GENERAL DE PUBLACIÓN, LEVANDADO EL 7 DE ABRIL DE 1940 [Guatemala] Dir. Gen. de Estadís., 885 pp.
- (6) INTER-AMERICAN COFFEE BOARD.  
1942. FIRST ANNUAL REPORT, 1941-1942. 152 pp. Washington, D. C.



~~~

- (7) JONES, CHESTER LLOYD.  
[1940.] GUATEMALA, PAST AND PRESENT. 420 pp., illus. Minneapolis.
- (8) MONCRIEFF, JOAQUIN O.  
1940. APUNTES SOBRE EL CULTIVO DEL TRIGO. [Guatemala] Dir. Gen. de Agr. Ed. 3, 11 pp.
- (9) PACHECO HERRATE, MARIANO.  
1939. AGRICULTURE IN GUATEMALA. Pan Amer. Union, 43 pp., illus. Washington, D. C.
- (10) PAN AMERICAN UNION.  
1934. GUATEMALA. Pan Amer. Union (Amer. Nation Ser., No. 10.), 29 pp., illus.  
Washington, D. C.
- (11) UNITED STATES TARIFF COMMISSION.  
1941. GUATEMALA. FOREIGN TRADE OF LATIN AMERICA, pt. 2 sect. 13. U. S. Tariff Comm.,  
58 pp., illus.

§

## THE AGRICULTURE OF CRETE . . . . .

By Clayton E. Whipple\*

*Agriculture on the island of Crete is confined largely to scattered plains, and only about one-third of the total area is suitable for agricultural undertakings of any kind. Emphasis is placed on the cultivation of olives, grapes, citrus, and other fruits. Although grain is produced, imports are needed to supplement domestic supplies. Olive oil, raisins, currants, citrus fruits, and nuts are the leading surplus commodities.*

Thousands of years ago one of the earliest of the great civilizations flourished in Crete. The strategic position of the island then as now was outstanding.<sup>1</sup> Roughly, the island is equidistant from Cyprus and Sicily, from Syria and Italy, from the Dardanelles and the mouth of the Nile, from the west coast of Asia Minor (at Izmir) and Cirenaica, as well as from Athens and Cirenaica. From Crete, as a center, this civilization was extended to various parts of the Aegean region. Trade relationships were also established with Egypt and other parts of the eastern Mediterranean at an early date.

Crete has an area of 8,616 square kilometers (3,320 square miles) or is about the size of Corsica (8,717 square kilometers or 3,367 square miles), is slightly smaller than Cyprus (9,279 square kilometers or 3,584 square miles), and about one-third the size of Sicily (25,721 square kilometers or 9,935 square miles) and of Sardinia (24,074 square kilometers or 9,299 square miles). The island is about 160 miles (256 kilometers) long and varies in width from 35 to 7.5 miles (56 to 12 kilometers). Although included in Europe, the island lies wholly south of Tunis. Crete comprises one of the 10 provinces of Greece and is divided into the 4 *nomoi* (prefectures) of Herakleion, Lasithion, Rethymnon, and Khania (see map, page 213). The 1928 official census gave it a total of 386,000 people and the census of 1940, 438,000, of whom about 70 percent were agricultural. The density of population in 1928 averaged about 47 persons per square kilometer (121.7 per square mile) or about the average for Greece as a whole (48 per square kilometer or 124.3 per square mile). One should keep in mind that less than one-third of the island is available for agriculture in any form. As a result of war, invasion, and evacuation, the present population of the island is probably less than 400,000 people.

Topographically the island consists of a limestone mountain range, traversing its entire length, interspersed with plains of varying sizes (see map, page 213). The mountains, which were forested in ancient times,<sup>2</sup> are now chiefly barren limestone rocks, though the higher peaks are snowclad throughout much of the year. A large area of upland pasture is found on the slopes of the mountains, and karstic plateaus permit of some cultivation at considerable height. The plains are encircled and isolated from one another by the mountains and karstic plateaus.

The principal plain of the island is that of Messara, located in the center of the island and having an effective area of about 350 square miles or 906.5 square

\* Office of Foreign Agricultural Relations.

<sup>1</sup> NEWBIGIN, MARION I. SOUTHERN EUROPE. 428 pp., illus. London. 1932. See p. 372.

<sup>2</sup> See reference cited in footnote 1, page 370.

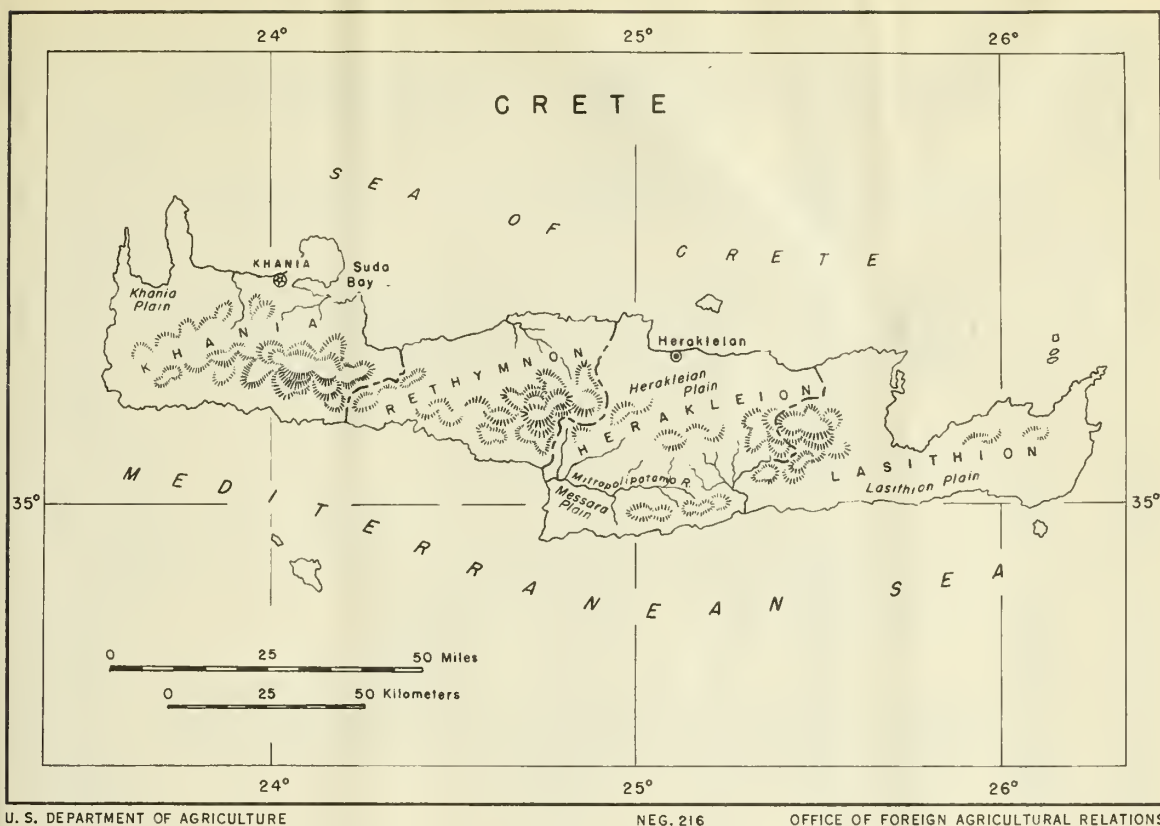


FIGURE 1.—Map of Crete.

kilometers. This is also the most fertile plain and is watered by the all-season Mitropoli Potamo River. To the north is the smaller plain of Candia or Herakleion which has relatively less land devoted to cereals but more to grapes, raisins, and olives. Another small plain is located south of Khania and Kisamou on the western end of the island and produces some cereals as well as grapes, figs, olives, and vegetables. At the eastern end of the island is the small, narrow, coastal plain of Lassithion producing cereals, potatoes and other vegetables, with some olives on the higher elevations.

Altitude is a fundamental factor in temperature, but there is danger in generalizing, and the climate of the island as a whole is moderated by the sea, with warm, dry summers and mild winters. High summer temperatures are found on the plains and cold winters in the mountains. Official records show an average annual precipitation of 704.9 millimeters or 27.8 inches, but 624.3 millimeters or 24.6 inches fall during the winter and only 80.6 millimeters or 3.2 inches during the summer months. The soils of Crete are chiefly residual due to mechanical weathering of the limestone rocks, and alluvial soils are found only along the streams in the valleys.

Agriculturally Crete may be defined as part of the semiarid, subtropical Mediterranean fruit zone of European agriculture, with subregions of pasture land located on the higher altitudes. A glance at the table will show that, like Greece as a whole, it is a region of cereal deficiency and of concentration on olives, raisins, citrus, and other fruits. In fact the percentages of production of these commodities are higher in Crete than in Greece as a whole in terms of the relative arable land concerned.

TABLE 1.- Crete: Acreage, total production, yield per acre, and per capita production of principal crops with percentage each is of Greek total production, 1933-37

CROP	ACREAGE		PERCENTAGE OF TOTAL CULTIVATED AREA		PRODUCTION 1		YIELD		PER CAPITA PRODUCTION 2		PERCENTAGE PRODUCTION IS OF GREEK TOTAL	
	1,000 hectares	1,000 acres	Percent	quintals	1,000 pounds	Quintals	per hectare	per acre	Kilograms	Pounds	Percent	Percent
Wheat .....	12.2	30.2	12.63	106	23.3	9	9	.7	25.0	55.1	1.49	1.49
Rye .....	.3	.7	.36	3	.7	9	9	.9	.7	1.5	.53	.53
Barley .....	19.4	47.9	20.13	196	43.2	10	10	.9	47.0	103.6	9.92	9.92
Oats .....	14.0	34.6	14.06	125	27.6	9	9	.8	30.0	66.1	11.21	11.21
Corn .....	.1	.2	.10	1	.2	11	11	1.1	3.0	6.7	.04	.04
Maslin .....	8.0	19.8	8.75	79	17.4	9	9	.9	19.0	41.8	20.61	20.61
Millet .....												.06
Other cereals .....			.02									.64
Total cereals .....	54.0	133.4	56.05	510	112.4	9.5	9.5	.8	94.7	208.8	3.68	3.68
Potatoes .....	3.0	7.4	2.75	182	40.1	69.0	69.0	5.4	43.0	94.8	14.04	14.04
Sesame .....	.1	.2	.19	61	13.4	3.3	3.3	6.7	.1	.2	.68	.68
Table olives .....	(3)		(3)	26	5.7	(3)	(3)	(3)	6.0	13.2	7.22	7.22
Olive oil .....	(3)		(3)	317	69.9	(3)	(3)	(3)	75.0	165.3	27.49	27.49
Broad beans .....	3.0	7.4	3.45	28	6.2	8.6	8.6	.8	6.7	14.8	18.42	18.42
Kidney beans .....	.2	.5	.20	1	.2	7.4	7.4	.4	.4	.9	1.89	1.89
Chickpeas .....	.7	1.7	.71	5	1.1	8.0	8.0	.6	1.3	2.9	5.40	5.40
Lentils .....	.7	1.7	.70	6	1.3	9.0	9.0	.8	1.4	3.1	12.30	12.30
Other legumes .....	4.0	9.9	4.20	39	8.6	10.0	10.0	.9	9.3	20.5	17.00	17.00
Vegetables .....	3.0	7.4	3.04	172	37.9	59.0	59.0	.5	41.0	90.4	4.83	4.83
Grapes for wine .....	15.0	37.1	15.55	425	93.7	31.6	31.6	2.5	100.1	220.7	11.99	11.99
Table grapes .....	2.0	4.9	2.18	103	22.7	48.8	48.8	4.6	24.3	53.6	13.74	13.74
Wine .....				4359	59,484.1							
Currants .....			.02			20.0	20.0	1.8	.1	.2	.03	.03
Raisins: Sultanas .....	7.0	17.3	6.79	167	36.8	25.6	25.6	2.1	39.5	87.1	62.21	62.21
Rozaki .....	2.0	4.9	2.53	51	11.2	21.0	21.0	2.3	12.0	26.5	97.61	97.61
Lemons .....				6	1.3	65,785	65,785		713.7		5.17	5.17
Citrons .....				17	3.7	65,012	65,012		711.9		91.88	91.88
Oranges .....				44	9.7	629,637	629,637		770.1		17.83	17.83
Mandarins .....				9	2.0	18,847	18,847		44.6		19.04	19.04
Pears .....				51	11.2				12.1	26.7	27.57	27.57
Apples .....				2	.4				.6	1.3	3.36	3.36
Figs, all .....				18	4.0				4.2	9.3	12.03	12.03
Chestnuts .....				9	2.0				2.0	4.4	11.93	11.93
Almonds .....				21	4.6				5.0	11.0	29.97	29.97
Walnuts .....				4	.9				.9	2.0	6.90	6.90
Carobs .....				212	46.7				50.0	110.2	83.13	83.13
Acorns .....				14	3.1				3.0	6.6	8.96	8.96
Mulberries & leaves .....				15	3.3				3.6	7.9	12.09	12.09
Tobacco .....	.3	.7	.39	3	.7	7.0	7.0	.9				
Anis .....			.09									
Cotton .....	.1	.2	.19	(8)	(9)	2.0	2.0	.3				

1 A quintal = 100 kilograms or 1/10 of a metric ton, which is equivalent to 2204.6 pounds. 2 Principal commodities only.  
 3 Data not available. 4 1,000 hectoliters. 5 1,000 gallons. 6 Number given in 100 pieces produced. 7 per capita production based on thousands of pieces. 8 Less than 500 quintals. 9 Less than 50,000 pounds  
 Compiled by the Office of Foreign Agricultural Relations from STATISTIQUE ANNUELLE AGRICOLE ET D'ÉLEVAGE DE LA GRECE, 1933-37.



TABLE 2.-Crete: Total livestock numbers, percentage of Greek total, average per 100 inhabitants, and average per unit of area, 1933-37

ANIMAL	NUMBER	PERCENTAGE OF GREEK TOTAL	AVERAGE PER 100 INHABITANTS	AVERAGE PER UNIT OF TOTAL AREA
	1,000 head	Percent	Head	Per hectare : Per acre
Oxen .....	21.0	4.3	4.9	2.5 : 6.1
Milk cows .....	.2	.1		
Other cattle .....	31.0	6.5	12.4	6.2 : 15.4
Buffaloes .....	.1	.1	.02	.01 : .02
Horses .....	5.0	1.4	1.2	.6 : 1.5
Mules .....	12.0	6.6	2.8	1.4 : 3.4
Asses .....	38.0	9.8	9.1	4.6 : 11.3
Sheep .....	479.0	5.9	113.3	57.1 : 141.2
Goats .....	313.0	6.0	74.0	37.3 : 92.2
Pigs .....	52.0	9.4	12.4	6.2 : 15.4
Rabbits .....	220.0	37.2	52.1	26.3 : 64.9
Poultry .....	931.0	8.0	220.5	111.2 : 274.8
Beehives .....	84.0		20.0	10.1 : 25.0

TABLE 3.-Crete: Number of cows milked, production of livestock products, distribution of milk, and percentage production is of total Greek production, 1933-37

PRODUCT	ANIMALS MILKED	PRODUCTION	DISTRIBUTION OF MILK		PERCENTAGE PRODUCTION OF LIVESTOCK PRODUCTS IS OF GREEK TOTAL PRODUCTION
			USED IN FLUID STATE	USED FOR DAIRY PRODUCTS	
Milk:	Number	1,000 quintals: 1,000 pounds: 1,000 quintals: 1,000 pounds: 1,000 quintals: 1,000 pounds:			Percent
Cow .....	275	60,626.5	139	30,643.9	137 : 30,203.0 : 4.15
Buffalo .....	3	661.4	3	661.4	(1) : 1.1 : 1.1
Sheep .....	0	0.0	0	0.0	0 : 0.0 : 0.0
Goat .....	147	32,407.6	66	14,550.4	81 : 17,857.3 : 3.3
	125	27,557.5	70	15,432.2	55 : 12,125.3 : 3.3
Cheese .....	21	4,629.7	2 121	26,675.7	2 : 26,675.7 : 3.60
Butter .....	1	220.5	2 16	3,527.4	2 : 3,527.4 : 1.30
Eggs .....	18	3,968.3			
Honey .....	3	661.4			
Beeswax .....	(1)	7.3			
Cocoons .....	1	220.5			
Wool .....	(1)	98.3			

1 Less than 500 quintals.  
2 Milk equivalent.

The relative importance of Crete's agricultural production is indicated by official statistics (see table 1) covering both acreage and production, with the latter expressed in percentages of the Greek totals. Barley, oats, and maslin represent, respectively, about 10, 11, and 21 percent of the national figures, whereas wheat accounts for only 1.5 percent, and corn is negligible. Legume production is relatively high, Crete producing 18 percent of the broad beans, 12 percent of the lentils, and 17 percent of other legumes.

Crete produces 27 percent of the olive oil of Greece, which is one of the leading olive-oil-producing countries of the world. Noted products of Crete are the Sultana and Rozaki raisins, of which nearly 20,000 tons were exported annually in pre-war years, as compared with a total of about 25,500 tons from all Greece. Crete produced about 98 percent of the total Rozaki crop and 62.2 percent of the Sultanas. It also produced the best qualities of these products. An important factor in the raisin industry was the arrival of Greek refugees from Turkey, who were very skillful in handling the crop.

The island is also an important producer of citrus fruits and nuts. Livestock is relatively less important, despite the area of pasture land available, because of climatic conditions and concentration of interest on fruit and nut production.

As indicated by per capita production figures, Crete is a deficit region in terms of grain. The average Greek consumes 141 kilograms (about 311 pounds) of flour annually, or about 170 kilograms (375 pounds) of grain, and the total production of Crete falls far below this, without taking into consideration seed, waste, and animal food. The island has a large surplus of olive oil, wine grapes, currants, raisins, citrus, and nuts and is normally an important exporter of these commodities.

## §

### NEW REPORTS

#### INSECTICIDES AND RODENTICIDES,

by A. F. Sievers and E. C. Higbee. Foreign Agriculture Report No. 8

Plants from many parts of the world contribute a number of efficient products for commercial use as insecticides and rodenticides. In some cases these products come from plants growing wild in such abundance that only their collection is necessary to supply the world demand. In others the plants are also grown as cultivated crops, and in still others the cultivated plant is depended upon entirely to furnish the quantities needed. The insecticides discussed include a number that repel rather than kill insects, but they are included because repellents are of general interest in connection with insect control. Only two plant products are in commercial use as rodenticides. The botanical source of each plant discussed is given. The range; nature; parts used; commercial uses, sources, and importance; propagation and culture; methods used in harvesting and preparing the drug for market; and average yields are indicated when information covering these subheads is available. Reference is made to outstanding publications that give more detailed data regarding the various plants.

## §